

# STANDARD OPERATING PROCEDURES OF THE INTEGRATED DESIGN AND BUILD TOLL ROAD CONSTRUCTION IN INDONESIA

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## Abstract

The government is striving for planned toll roads to be realized so as to increase connectivity, competitiveness and lower logistics costs. In turn, the toll road can be the backbone that supports the growth of the national economy as well as the equitable distribution of development. Based on the review of Indonesia Toll Road Authority of the Ministry of Public Works and Housing in 2017, it is projected that Indonesia will have an additional 1,851 km of new toll roads by the end of 2019. The additional projection of the new toll road exceeds the targets set in the Strategic Plan of the Ministry of Public Works and Housing 2015-2019 as long as 1,060 km. The additional projection of new toll roads is possible besides the acceleration of land acquisition process through bailout fund by Toll Road Business Entity also introduced system delivery innovation by implementing Integrated Design and Build Constructions. Therefore, it needs to be equipped with Standard Operating Procedures for the Integrated Construction Design and Build on Toll Road Project in Indonesia.

**Keywords:** toll road, standard operating procedures, toll road authority, toll road business entity

## Abstrak

Pemerintah sedang mengupayakan ruas-ruas jalan tol yang direncanakan untuk direalisasikan sehingga dapat meningkatkan konektivitas, daya saing, dan menurunkan biaya logistik. Pada gilirannya, jalan tol dapat menjadi tulang punggung yang mendukung pertumbuhan ekonomi nasional serta pemerataan pembangunan. Berdasarkan kajian Badan Pengatur Jalan Tol, Kementerian Pekerjaan Umum dan Perumahan Rakyat, pada 2017, diproyeksikan bahwa Indonesia akan memiliki tambahan 1.851 km jalan tol baru pada akhir 2019. Proyeksi tambahan jalan tol baru ini melebihi target yang ditetapkan dalam Rencana Strategis Kementerian Pekerjaan Umum dan Perumahan Rakyat 2015-2019, yaitu sepanjang 1.060 km. Proyeksi tambahan jalan tol baru dimungkinkan karena selain percepatan proses pembebasan tanah melalui dana talangan oleh Badan Usaha Jalan Tol juga diterapkannya sistem *Design and Build Integrated Constructions*. Karena itu diperlukan adanya Prosedur Operasi Standar untuk *Integrated Design and Build Constructions* untuk proyek-proyek jalan tol di Indonesia.

**Kata-kata kunci:** jalan tol, prosedur operasi standar, badan pengatur jalan tol, badan usaha jalan tol

## INTRODUCTION

The program boosted by the government of Republic of Indonesia in the last three years is the construction of various infrastructure including the construction of toll roads. The targets set are 1,100 km of toll roads to be built by the end of 2019 as stated in the Strategic Plan 2015-2019 of the Ministry of Public Works and Public Housing.

The realization of additional toll road in 2015 is 132 km, then in 2016 increased by 44 km to 176 km. In 2017, it was projected to have an additional 391.9 km, so that the total

additional length of toll roads operated to be 567.9 km. Furthermore, in 2018, it is projected to increase by 615 km to 1,182.9 km, and in 2019 there will be an additional of 669 km, making a total of 1,851.9 km.

Based on the review of the Indonesia Toll Road Authority (ITRA) in 2017, until 2019, Indonesia is estimated to have an additional 1,851 km of new toll roads. Although the projected length of toll roads operating in 2019 is not a government promise. However, it can be assured that achievements by the end of 2019 will exceed the Strategic Plan target.

The government seeks to have planned toll roads realized to improve connectivity and competitiveness and decrease logistics costs. Finally, the toll roads can support national economic growth and equitable development.

In order to realize the projection target, one of the efforts, besides accelerating the process of land acquisition through bailout by Toll Road Business Entity (TRBE), is the implementation of Design and Build Integrated Construction on Toll Road Construction Project which is expected to accelerate the achievement of road projections the new toll road. This paper discusses the Standard Operating Procedure (SOP) for the implementation of Design and Build integrated construction delivery models as the basis for the implementation of toll road construction in accordance with the provisions of the Toll Road Concession Agreement. The aim is to provide assurance that the processes and procedures carried out will provide results that meet all technical requirements of the toll road in accordance with technical regulations.

## **STRATEGIC PLAN OF THE MINISTRY OF PUBLIC WORKS AND HOUSING 2015-2019**

In the Strategic Plan of the Ministry of Public Works and Housing 2015-2019, Indonesia is targeted to have 1,060 km of new toll roads by the end of 2019. However, based on the review of the Indonesia Toll Road Authority (ITRA) in 2017, the estimated achievement of additional new toll roads is 1,851 km, greater than the Strategic Plan target. This estimation may possible because of the acceleration of land acquisition with bailouts from the Toll Road Enterprises, as well as carrying out construction contracts with integrated design and build. Figure 1 illustrates the operating toll targets in accordance with the Strategic Plan 2015-2019 and the results of the evaluation of the 2017 operating toll targets along with its toll road segments.

From the description of Figures 1 and 2 show that the Government is trying to make the planned toll road as the back bone of the economy can be realized and operational soon. In order to reduce the infrastructure back log, to increase connectivity and competitiveness and to decrease logistics costs, in turn, may support national economic growth and equitable development. With that background, it is an inspiration to innovate system delivery with integrated design and build scheme.

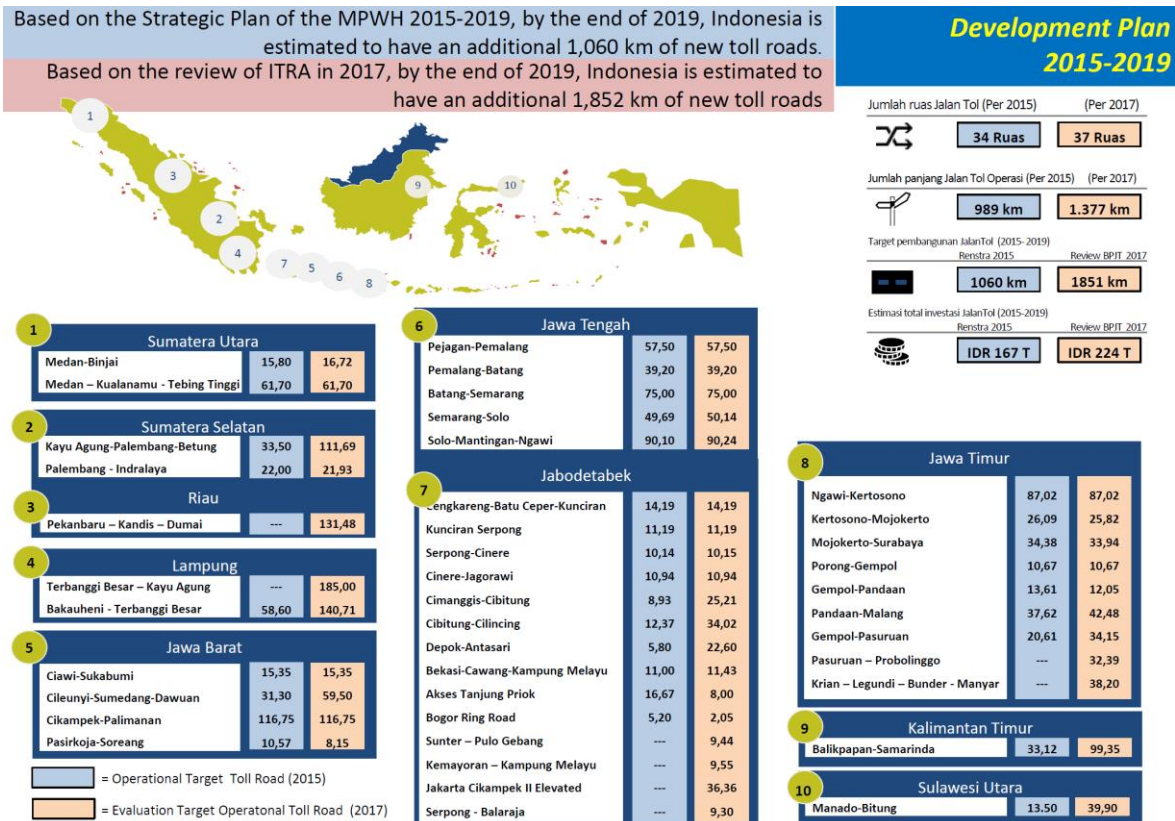


Figure 1 Strategic Plan, Review ITRA, and New Toll Road Segment (BPJT, 2018)

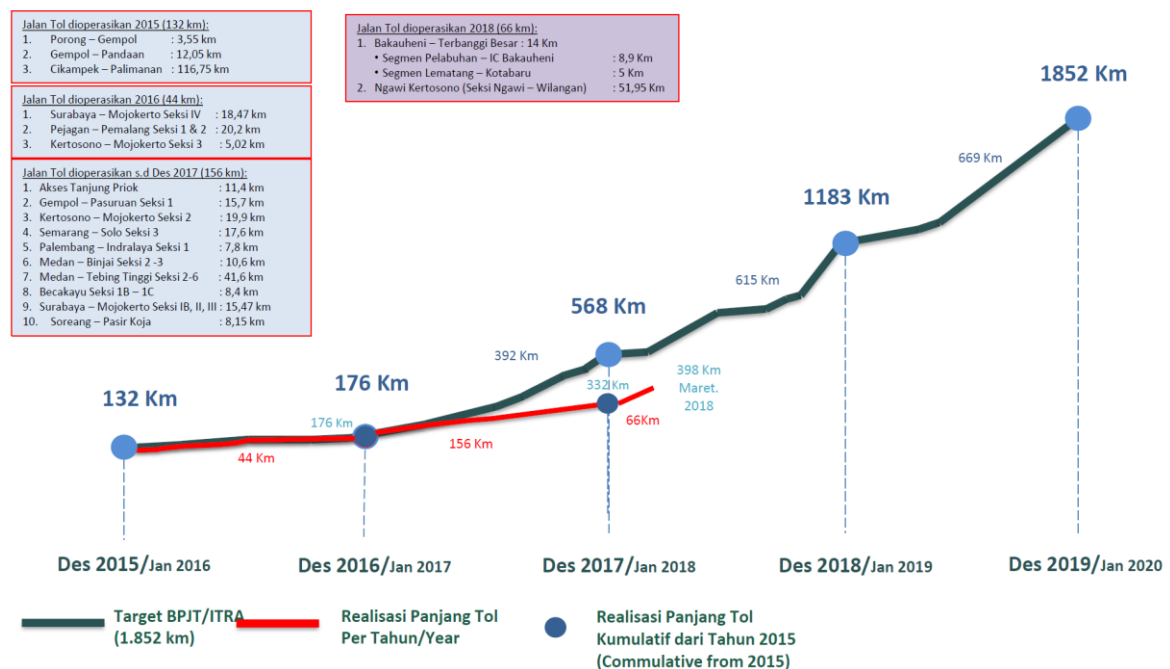
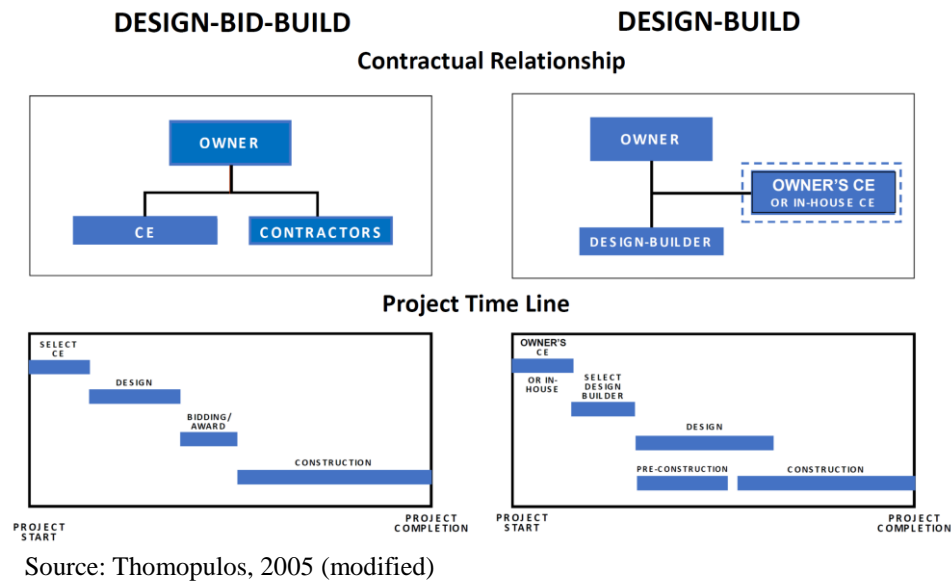
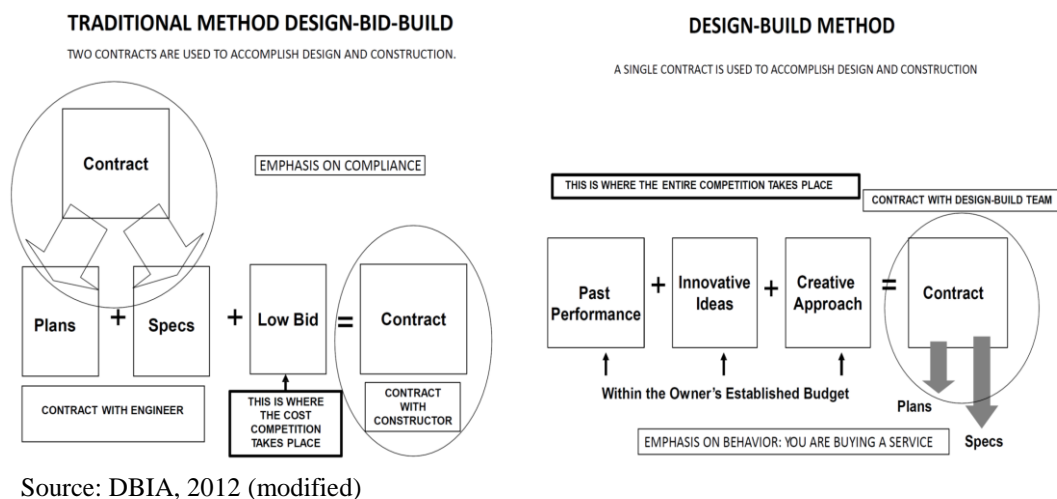


Figure 2 Toll Road Construction Plan and Completed 2015-2019 (BPJT, 2018)

Design and build as understood today, discovered or in the idea by contractors in the early 1960s, when a number of building contractors began to offer the package. The contractor offers a complete "package", in contrast to traditionally fragmented procurements, which have separate agreements contract with consultants and contractors. According to DBIA (2012), Design Build is a project delivery method whereby a single engineering contractor entity is integrated into a single contract with the building owner to provide engineering design services and construction services. Engineering and construction design services are implemented simultaneously or parallel and integrated.



**Figure 3** Contractual Relationship and Project Time Line DBB & DB



**Figure 4** Design Bid Build and Design Build

Contractual relationship and project time line Design Bid Build and Design Build are illustrated as shown in Figure 3. Figure 3 on the contractual relationship it appears that the Project Owner binds the contract to two parties namely: (1) Engineering Consultant;

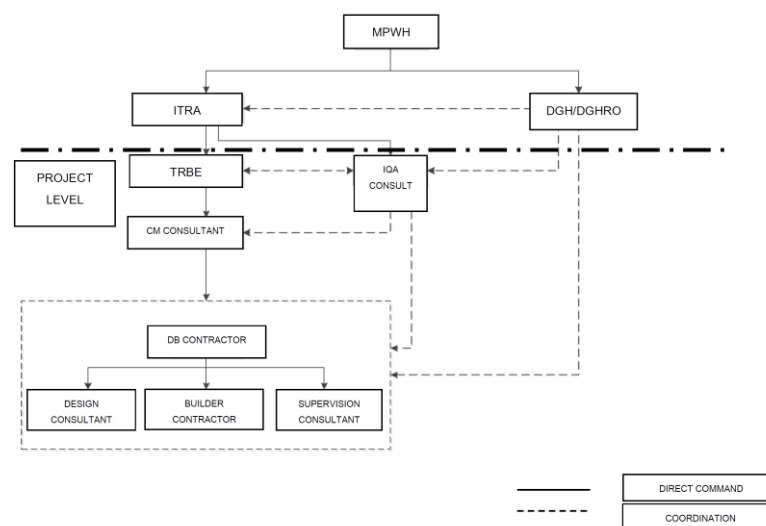
and (2) Contractor on the design bid build scheme, while the project owner's design build scheme only binds contracts with one party only i.e. with Design Builder.

From the description in Figures 3 and 4, the Integrated Design-Build delivery method can be expected to accelerate the development of toll roads in Indonesia. Benefits that can be obtained from D & B methods according to DBIA, 2013 are: faster project completion time; lower cost; higher quality; greater owner satisfaction, reduced litigation, change orders which may cause increase costs; can meet a limited budget; encourage workers to complete work faster so that the costs become lower.

## STRUCTURE, DUTIES, AND FUNCTIONS OF THE PARTIES ON THE DESIGN AND BUILD SCHEME

The parties involved in toll road development projects with integrated design and build schemes constructed by Toll Road Business Entity (TRBE) structurally can be illustrated as in Figure 5.

Figure 5 shows that DB Contractor carries out the design, construction and supervision that can be done solely by the DB Contractor or contracted to another party. The function of Construction Management Consultant is to assist the Toll Road Business Entity (TRBE), whereas Independent Quality Assurance (IQA) Consultant is a consultant assisting DGH/DGHRO and ITRA. The description of authority, duties and responsibilities of stakeholders in the Design and Build scheme of the Toll Road Construction Project is summarized in Table 1, showing which stake holders or parties are involved and their respective duties, function and responsibilities party.



*MPWH: Minister of Public Works and Housing*

*DGH: Directorate General of Highways*

*DGHRO: Regional Office DGH*

*IQA Consultant: Independent Quality Assurance Consultant*

*TRBE: Toll Road Business Entity*

*CM Consultan: Construction Management Consultant*

*DB Contractor: Design Build Contractor consists of:*

*a. Design Consultant (DC)*

*b. Builder Contractor (BC)*

*c. Supervision Consultant (SC)*

**Figure 5** Structure of The Parties Involved

**Table 1** Matrix of Duties, Function, and Responsibilities of the Parties

No.	Job Description	DGH/DGHRO	ITRA	TRBE	CM Conslt	D & B Contractor/ Service Provider	IQA Conslt
1.	Toll Road Concession (TRC) Agreement	Receive Copy of TRC Agreement	Signing TRC Agreement	Signing TRC Agreement			
2.	Bid of Design & Build Contractor (Service Provider)		Receive Report	Approval Bid Document D & B Service Provider	Preparing Bid Document D & B Service Provider	Bid Participant (Bidder) D & B	Check Bid Document D & B Service Provider
3.	Field Survey			Receive Report Survey Result	Supervise and Check Survey Result	Planning, Implement, and Supervise	
4.	Review Basic Design Document			Approve	Check	Planning, Implement, and Supervise	
5.	Approval Review and Addendum Scope of Work (if any)	Accept and Approve Review and Addendum Scope (if any)	Discuss and Propose Approval of Legalization	Propose Approval of Endorsement	Check	Submist Revises Results and Addendum Scope	Report Revises of Scope Changes to ITRA and DGH
6.	Details Design in Stages According to The Needs of The field	Acknowledge	Acknowledge	Approve	Check (Quality Assurance)	Planning, Implement, and Supervise	Check
7.	Implementation of Construction in Stages		Receive Report	Approve	Check (Quality Assurance)	Planning, Implement, and Supervise	Monitoring and Reporting to ITRA
8.	Design Variations/ Changes		Receive Report	Approve	Check (Quality Assurance)	Planning, Implement, and Supervise	Coordination and Evaluation
9.	Provisional Hand Over (PHO)		Acknowledge	Approve	Check	Requesting PHO	Ensure Conformity Scope with Construction Results
10.	Feasibility Fuction		Approve	Requesting	Checking Requisites	Setting Up the Prerequisite	Prepare and Report the Results of Pre-feasibility Function

## PHASE OF THE TOLL ROAD INTEGRATED DESIGN AND BUILD CONSTRUCTION

The Toll Road Integrated Design and Build Construction consists of three phases, they are document of DB service provider, Design and Construction and Post Construction.

### 1) Preparation Document of Design and Build Service Provider

#### *Basic Design Document*

The ITRA shall issue preliminary documents to be submitted to the Toll Road Business Entity (TRBE) as stipulated in the the Toll Road Concession Agreement (TRCA) to be realized in the construction. The initial document consists of the results of the initial

survey, basic design drawings, reports and calculations of basic design and others. TRBE recruits the Construction Management (CM) Consultant to assist in preparing the document of the Toll Road Design and Builder Contractor. After the appointment of the Design and Build Contractor by the TRBE then the DB Contractor will evaluate or review the basic design drawings by considering the latest conditions.

The review of the basic design drawings document in the field is carried out under the supervision of the CM Consultant and the Independent Quality Assurance (IQA) consultants, with the DB Contractor first preparing the design review process of design submitted to the TRBE and subsequently reported to the ITRA under the following conditions:

- a) Activity preparation review of the basic design drawings that are part of the initial document begins and implemented in accordance with the period of time specified in the contract agreement Design and Build toll road between TRBE and the DB Contractor so that the implementation time of the Basic Design drawings review can be resolved within the time limit that does not interfere time of overall construction and integrated construction of all construction plans.
- b) The Work plan review of Basic Design drawing is a work program that contains about the implementation of the review Basic Design Drawing includes detailed plan survey, Design Criteria, Design Concept and coordination with relevant parties and local Government as the basis for the changes of the Basic Design drawings required, is submitted to the TRBE and reported to the ITRA.
- c) The work plan submitted by the DB Contractor, checked by the CM consultant, is approved by the TRBE and reported to the ITRA.

#### *Result of Survey Report*

The implementation and report of Survey result shall be regulated as follows:

- a) Field survey results is carried out in accordance with the work plan, including evaluating the suitability of the Basic Design Drawing and the ROW Plan requirements on current actual field conditions and the results of coordination with relevant agencies and local Government.
- b) Reports of survey results to be submitted to the ITRA include:
  - Topographic Survey;
  - Hydrological Survey;
  - Geotechnical and geological Survey;
  - Survey of existing road network and existing road function around Toll Road corridor as well as crossing that directly related to toll road plan;
  - Survey of existing drainage network around Toll Road corridor and crossing;
  - Utility Network Survey on toll road area; and
  - Land use survey of the toll road Right of Way (ROW) area.
- c) The results of the field survey are checked by the CM Consultant, seen by the TRBE and reported to the ITRA.

### *Report of the Review of Basic Design Drawing*

The Review Basic Design Drawing refers to the Basic Design Drawings, the results of field surveys and the results of coordination with relevant agencies and local Government. Submission of report the review results Basic Design Drawing to the ITRA with the following conditions:

- a) The TRBE and the DB Contractor must coordinate with all relevant agencies, and local Government, on the areas where toll road will be traversed but not limited to aspects of crossing buildings, irrigation canals, utilities, handling of roads tangent to toll roads or toll road access, plantation areas, conservation areas, and protected forests.
- b) Coordination with the local Government by exposing the toll road development plan as point (a) to obtain information and inputs and minimize design changes and social disturbance impacts that may hamper the construction process.
- c) The results of coordination/discussion with relevant agencies are submitted and reported to the ITRA along with supporting documents.
- d) The results of the Review Basic Design Report include the following reports:

- (1) Design Criteria and Design Concept Criteria

Report design criteria and design concepts that should be reported, including:

- Design criteria and road geometric concepts;
- Design criteria and concepts of pavement structures;
- Design criteria and structural design concepts (bridges, overpas, interchange);
- Criteria and drainage network concept;
- Criteria and design concepts of geotechnical handling;
- Criteria and design concepts of building equipment and toll infrastructure; and
- Special Specifications.

- (2) Road Geometric Report

Data to include:

- Plan and profile of main roads, interchanges, crossroads of toll roads across non-toll roads, taking into account the number of lanes and the need for toll booths;
- Plan and profile on / off ramp or rest area;
- Plan local crossing path profile (overpas, underpas); and
- Typical cross-sectional drawings.

- (3) ROW Requires Report

The ROW requires report is made referring to the survey results on the land needs of the main road plan and the on/off ramp, interchanges, overpasses, underpasses, toll gate areas and rest areas.

- (4) Report on the Scope of Work Requirements

Job Requirement Scope Report is a report of survey results and coordination with related agencies and local Government including requirement length of



main roads, access roads, interchange, number of overpass and underpass and other complementary buildings.

#### *Approval Review of the Basic Design Drawings*

The review of Basic Design Drawings on the TRBE proposal will be approved by the Head of the ITRA. The approval of review Basic Design Drawings will be the basis of addendum process the scope of work if the change of Basic Design Drawings impact to change of trace, requirement of the ROW and influence to public interest. Review of Basic Design Drawings as a basis in the process of drawing up the details Design and Build Drawings of each construction with approved design criteria and design concepts as reported and submitted by the TRBE.

#### *Implementation of Field Work During Basic Review Process Design*

- a) To fill out the activities in the field during the review process of the Basic Design Drawings Draft, the DB Contractor conducts physical activity activities in the non-structural field including preparatory activities, site facility preparation, work access road construction, quarry survey and material testing, clearing, grubbing and other activities that already have land and technical certainty.
- b) If the Basic Design Drawing document is not changed or only partially and still in accordance with the conditions of the field then the DB Contractor can directly carry out the preparation of details of Design and Build and the implementation of the construction under the supervision of the Supervisionl Consultant (SC).

## **2) Construction**

#### *Preparation of Design and Build Picture Details*

The stages of drawing up the detail drawings of the Design and Build Drawings are the stages as a follow-up to the approval of the review of the Basic Design Drawings so that in detail the Design and Build drawings of each construction can be carried out immediately, subject to the following conditions:

- a) **Schedule of Design and Build Picture Detail Drawing**  
The drawing schedule of Design and Build drawings is adjusted to take into consideration the construction plan and the work methods to be performed by the DB Contractor.
- b) **Basic Drawing of Design and Build Drawings Details**  
The Detail Design and Build Drawings is prepared based on the review of Basic Design drawings considering design criteria and design concepts that have been submitted and approved by the ITRA.
- c) **Approval and Review of Design and Build Drawings Details**  
Approval and checked of the detail Design and Build drawings of each type of construction will be carried out by the TRBE/project level with the following conditions:

- (1) The DB Contrator performs the Design and Build Drawings detail by appointing a qualified design consultant as well as the law on the competence of the designer's consultant in the roads and bridges.
- (2) Detailed Report of Design and Build Drawings submitted by the DC to TRBE by first checking by Independent Checker (if required). The Design and Build drawing detail report contains detailed study and calculation analysis of each type of construction with reference to the design criteria and concepts approved by the ITRA and in case of any change in design criteria or concepts must be reported and re-submitted to the ITRA for approval.
- (3) Design and Build Drawings details are submitted progressively according to the stages and sequence of the construction requirements in the field.
- (4) Other completeness in the Design and Build Drawings detail report includes:
  - Detailed calculation of the structure of each type of construction;
  - Detail Design and Build Drawings;
  - Calculation of work volume;
  - Working methods;
  - General Technical Specifications;
  - Special Technical Specifications; and
  - Standard procedures of work and job performance.
- (5) The Design and Build Drawings details report is approved by the head of the Design Consultant of the DB Contractor and submitted to the TRBE by first checking by the Independent Cheker (if required). Periodically the TRBE must report detail drawings of Design and Build Drawings to the ITRA.

### *Construction Implementation*

The stages of construction implementation are the stages in which the Builder Contractor undertakes construction on the basis of a detailed document of Design and Build Drawings including the General Technical Specification and the Specific Technical Specification which has been approved by the CM Consultant. The implementation process of construction shall be regulated with the following conditions:

#### a) Preparation for Implementation of Work

The Builder Contractor (BC) prepares the implementation of each work to be carried out covering, working drawings, material specifications, work methods, work quality control methods and Safety and Security standards. Includes equipment and readiness of the worker either the implementation part or the internal controlling part of the BC. The document will be examined by the CM Consultant how far the readiness for the implementation of SOP for each job can be fulfilled and the adequacy of ROW land availability.

#### b) Implementation of Construction Works

After the preparation of the work performed, the Builder Contractor (BC) will carry out the work in accordance with the Design and Build Drawings Detail and with the

SOP or working method approved by the CM Consultant. The BC will undertake the implementation of the construction under supervision and quality control carried out internally by the DB Contractor i.e Supervision Consultant, whereas the CM consultant will ensure that the implementation procedures and quality control processes run in accordance with the specified standards and specifications, assist in coordination for the smooth running of the work, as technical Advisor, Quality Assurance and time control to achieve the target implementation time. The IQA Consultant in this case serves to evaluate the potential for delays, evaluate quality management systems, work procedures, and fulfillment of implementation schedules.

c) Design Adjustment on the Field

In the process of construction implementation in case of problems or special requests it is necessary to adjust the design by the DB Contractor (Design Consult) in accordance with the field conditions and targets to be achieved for this consultant. The CM Consultant will conduct a field inspection to ensure the necessary adjustment of design due to the problem. The Design Consultant of DB Contractor have to make the necessary detail design drawings including with the technical justification.

If the design revision is minor i.e. design adjustment which has no impact on the alignment and the ROW plan, then the inspection and approval of the design adjustment draw will be done at the level of the CM Consultant and the TRBE. When the design adjustment is major i.e. changes that affect the alignment and ROW plan then the examination and approval will be done up to the level of the ITRA. The IQA Consultant in this case will conduct evaluation and coordination to ensure the level of handling of such design adjustments.

d) Work Supervision

The supervision of the day-to-day work will be performed internally by the Service Provider supervisor and externally by the CM Consultant that the outcome of the work is in accordance with the objective of compliance with the technical requirements and quality achievements, Time, Cost and meeting the safety, security and environment requirements.

e) Work Quality Control

Prior to the commencement of work, the Contractor shall communicate the quality requirements of the work as set forth in the terms of the service user. Implementation of quality control will be done starting from material quality, mix (job mix), until the work process so that expected result of end of work quality can be achieved. The results of testing and evaluation of the quality of work shall be recorded and the quality control provisions of each work shall be stipulated in the Specifications under internal control by the Service Provider's supervisor and externally by the CM Consultant. The IQAC will ensure quality control procedures

work well. Reports of quality control results of each work are reported to the ITRA and the IQAC as the ITRA representatives in the field.

f) Reporting

All activities ranging from design detail, progress and quality control of construction implementation and adjustment of design on site occurring periodically should be reported to the ITRA. Periodic reports of such construction activities made by the service provider are examined by the CM consultant and approved by the TRE to be submitted to the ITRA. The report on the execution of the work is not limited to the periodic report but does not rule out the existence of a special report as necessary.

g) Discussion on Addendum Scope of Work

The TRBE may conduct deliberations and negotiations with the ITRA on changes in the scope of work on the basis of design changes and construction results for report in the scope of addendum.

### 3) Post Construction

#### *Hand Over*

Hand over of work will be done after all work has been completed. The terms of hand over of the work are regulated as follows:

#### Provisional Hand Over (PHO)

a) After the construction completed or completing progress at least 98%, the Builder Contractor may request for Provisional Hand Over to the TRBE.

b) The CM Consultant will facilitate the process of handover of work by making the schedule and stages of the first handover process or provisional hand over (PHO).

The stages of the process is as follows:

- Establishment of the Hand Over committee by the TRBE;
- Coordination meeting of the work hand over committee to arrange the division of tasks in the examination process both administrative and physical field;
- The committee makes the first visit to examine and record defects and deficiencies (defect and deficiencies) of work, commissioning test, or testing sampling;
- The Service Provider performs repair improvements as well as defect and deficiencies findings;
- The second visit of the job-handling committee to ensure defects and difficulties have been completed;
- The Committee issues the Provisional Hand Over (PHO) Report in which the Contractor remains responsible for fulfilling the completeness or deficiency in the functional and operational feasibility process; and
- The Builder Contractor shall perform maintenance of all toll road constructions during the maintenance period in accordance with the Contract of Agreement with the TRBE.

- c) The DBC must submit the handover document in the form of:
- Drawing of Implementation Result (As Built Drawing);
  - Work quality control report;
  - Manual of road maintenance, bridge and facilities and toll road equipment; and
  - Photo/video project.

The report is submitted in hard copy and soft copy.

#### *Assesment Function and Operation*

After completion of the construction, there will be an assessment of the feasibility of Toll road function and operation by the ITRA to meet minimum service standard of Toll Road. Function and operational feasibility also involves the Ministry of Transport/ DG Land Transportation and the Traffic Police Corps associated with road safety standards and roads.

## **CONCLUSION**

To support the planned toll road as the back bone of the economy can be realized and operational, it is necessary to apply the integrated design and build delivery method in order to realize the project completion time faster. From the description that has been presented, it can be concluded that the implementation guidance has presented the basic in the implementation of the integrated construction design and build in accordance with existing regulation, it is seen in the following:

- 1) design and build scheme, together with the authorities, duties and responsibilities of each party in accordance with the prevailing laws and regulations.
- 2) The stages of the design and build implementation process in these implementation guidelines provide an overview of the working mechanisms of stakeholders involved in toll road development projects with design schemes in Indonesia.

Hopefully, these implementation guidelines can serve as the basis for the construction of toll roads in accordance with the provisions of the Toll Road Concession Agreement. So, it can provide certainty of process and procedure with the fulfillment of all technical requirements of toll road according to the prevailing technical regulations.

This implementation guideline is an initial guideline procedures for accompanying the implementation of the integrated design and build delivery model in toll road construction project in Indonesia. It is still necessary to observe continuously to improve both its own implementation guidelines as well as the technical regulations that become its reference. Thus the implementation of the design and build delivery method of toll roads in Indonesia may receive optimum benefits, not only accelerate the project completion time but also other benefits as well as the best practices that have been applied in developed countries.

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